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# Snow Depth Survey of the Parsnip and Finlay River Drainages, Williston Reservoir Watershed, March 1994

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The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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## INTRODUCTION

As part of the Peace/Williston Fish and Wildlife Compensation Program's (PWFWCP) goal to enhance and protect winter habitats for wildlife, snow depth surveys of the Williston Reservoir watershed were initiated to help identify important low-elevation ungulate winter range (Davidson and Dawson 1990).

Snow depths can have a major impact on the movements of wildlife by impeding their locomotion and increasing their energy expenditure, as well as restrict their ability to access required food resources. The extent that a particular animal can be affected depends on the wildlife species being considered, the age and sex of the animal, and also the type of food item being sought after (e.g., herb, shrub, tree). Moose (*Alces alces*) can be severely restricted by snow depths greater than 70 cm while white-tailed deer (*Odocoileus virginianus*) movements are constrained by snow depths over 40 cm (Kelsall 1969). Younger animals of each species are generally further disadvantaged (Telfer and Kelsall 1979).

The availability of a forage item in winter is dependent on the extent that the animal will search out its food (e.g., only use visual clues), and the form (e.g., deciduous vs. broad-leaved evergreen), flexibility and vertical height of the plant. The characteristics of the plant can greatly influence the degree that the plant is vertically displaced and buried by snow. Caribou (*Rangifera tarandus*) are known to crater (dig) through snow up to a metre in depth to access terrestrial lichens (Johnson 2000), whereas Stone's sheep (*Ovis dalli stonei*) were found to avoid areas with >30 cm of snow cover, even though abundant forage was beneath (Seip and Bunnell 1985). Other ungulates such as moose, elk and deer –that typically browse on the above-snow forage biomass during winter– usually alter their behaviour by using areas that have lower snow accumulations in winter (i.e., sites that are normally lower in elevation).

Snow depth is not, however, the only parameter of snow that can influence an animal's movements and foraging ability. The snow density and hardness (presence and thickness of ice layers) can also greatly affect the animal's mobility and access to food by affecting their sinking depth and cratering ability. Nonetheless, snow depths are easily measured and are relatively good indicators of winter habitat suitability for grazing and shrub-browsing ungulates (i.e., lower snow depths generally indicate less restrictions to movement and a greater plant biomass available), provided that suitable forage species and other life requisites (e.g., thermal and escape cover) are present in the area. Therefore, by identifying what areas have lower accumulations of snow, these areas can be assessed more fully to identify their site potential

(i.e., ungulate winter range potential) and, thus, their potential for future enhancement activities and/or alternative management options.

A snow depth survey of low-elevation sites within the Williston Reservoir watershed was first conducted by the PWFWCP in 1990 (Martin 1994). In 1994, snow depth measurements were again collected from primarily lower elevation sites within the Parsnip and Finlay River drainages of the Williston Reservoir watershed. This report documents the findings of the 1994 survey and attempts to identify snow-depth patterns in the surveyed area using the 1990 and 1994 data.

## SURVEY AREA AND METHODS

Snow depth measurements were collected from sites throughout the Parsnip and Finlay River drainages (54°25' to 56°55' latitude) of the Williston Reservoir watershed, March 1994 (Figure 1). To assist in the identification of potential key ungulate winter ranges, the survey was scheduled for early March when snow accumulations are characteristically deepest at lower elevations in the watershed (BC Environment 1997) but, due to inclement weather (e.g., freezing rain), the survey was not conducted until 15 and 16 March. A 2-person crew obtained sample measurements from 97 sites; sites were accessed using a Bell 206 helicopter. Fifty-four of these locations were at or near low-elevation sites (670-1,150 m) surveyed in 1990 (Martin 1994), whereas the remaining 50 sites included new low-elevation sites sampled in the Parsnip, Crooked and Nation River drainages and a few sites (up to 1,700 m) known to be frequented by caribou (Wood 1996). In addition, 7 sites adjacent to plowed primary logging roads along the east side of the reservoir's Finlay Reach were surveyed by Fletcher Challenge Canada Ltd. (FCCL) personnel on 28 March; these sites had also been surveyed by FCCL in 1990 (Martin 1994). Sites surveyed north of the Davis River (Finlay Reach east) by FCCL in 1990 were scheduled to be surveyed again in 1994 but unfortunately data were not able to be collected.

Low-elevation sites surveyed in the Parsnip and Finlay River drainages predominantly lie within the moist-cool and wet-cool Sub-Boreal Spruce subzones (SBSmk and wk) and the dry-cool Boreal Black and White Spruce subzone (BWBSdk) (DeLong 1996, DeLong et al. 1993, MacKinnon et al. 1990). The few exceptions are the eastern tributaries (Missinka, Hominka, Table and Anzac Rivers) to the Parsnip River that are situated in the very wet-cool SBS subzone (SBSvk) (DeLong 1996). Higher elevation sites in the Gillis Creek and Chase Mountain areas are located in the moist-very cold Engelmann Spruce – Subalpine Fir subzone

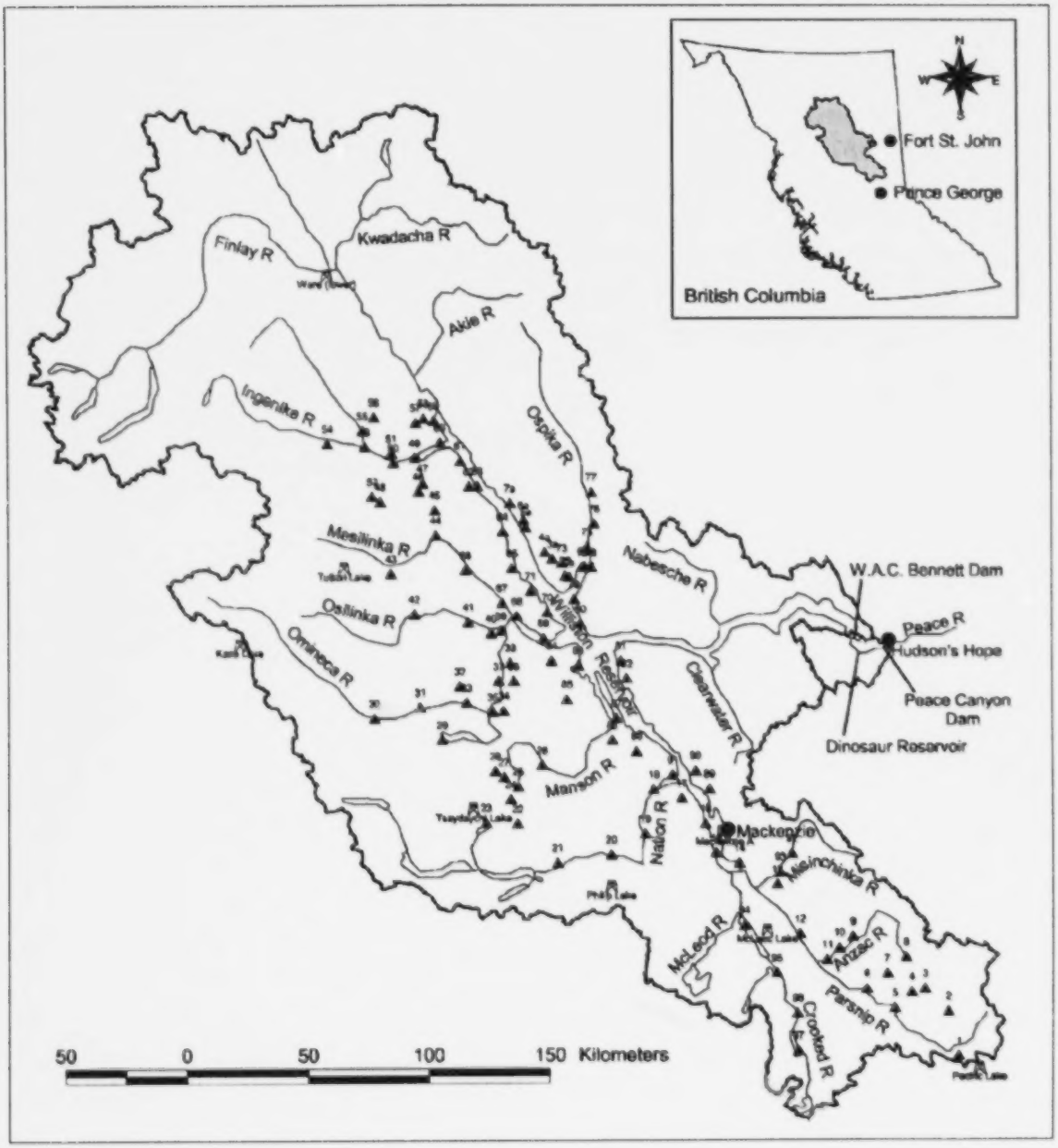


Figure 1. Location of snow-depth sample sites and provincial weather stations within the Parsnip and Finlay River drainages, Williston Reservoir watershed, March 1994.

(ESSFmv; MacKinnon et al. 1990, DeLong et al. 1994), and the northwest portion of the Mount Ferguson area is situated in the moist-cool Spruce-Willow-Birch subzone (SWBmk) (MacKinnon et al. 1990).

Snow depth sampling methods followed procedures detailed in Martin (1994). At each site, 2 to 5 measurements were made approximately 2 to 3 m apart using a rigid metre-stick. A mean snow depth was then calculated to represent the site. Location co-ordinates and a brief description of each site were recorded; the latitude and longitude of each site were identified using the helicopter's onboard Global Positioning System (NAD 27 datum). An attempt was made to locate sites in small openings on relatively flat ground (0-10% slope), thus reducing the potential effects of wind, temperature and sun-incidence variability that can occur in larger openings and in areas with different slopes and aspect. Site elevations to the nearest 50 ft were obtained using the helicopter's altimeter, values were then converted to metres and rounded off to the nearest 10 m. Elevations for sites measured by FCCL staff were estimated to the nearest 25 m using 1:250,000 topographic maps.

Further to the above survey, monthly snow depths were compiled from 8 provincial weather stations at lower elevations in the Parsnip and Finlay River drainages (Figure 1); monthly data were collected on or near the first day of each month (BC Environment 1997). For each station, the mean monthly snow depth reported was based on the average of all monthly snow depths that were recorded since the station was established, rather than the 'normal' (30-year average, 1960-1990) snow depth that is typically referenced by BC Environment.

In an attempt to discern snow depth patterns in the surveyed area, the mean snow depth for each site was changed to a snow depth zone identifier: *skiff* (0-19.9 cm), *very low* (20.0-39.9 cm), *low* (40.0-59.9 cm), *moderate* (60.0-79.9 cm), *deep* (80.0-99.9 cm) and *very deep* (≥100 cm). A site's zone identifier and 1:250,000 topographic maps were then used to determine areas of similar snow depth. Inter-zone boundaries were drawn where notable topographic changes occurred between the two closest sites with different zone identifiers. Where no noticeable topographic changes occurred, boundaries were subjectively placed at mid-distances or significant features (e.g., creeks) between the two sites. An elevation boundary was set at 850 m for areas in the SBSmk and 1,100 m for areas in the SBSwk and BWBSdk; in cases where sites were sampled above 1,100 m, the elevation boundary was placed about 100 m above the sampled sites. On a few occasions, some relatively small areas had sites that spanned more than one snow depth zone. For simplicity, these areas were presented as

complex zones (>1 zone identifier) because delineation of the transition point would have been difficult and confusing for the area involved.

The resulting snow-depth zone maps were then compared with the 1990 zone maps (Martin 1994) to identify between-year patterns. These patterns were then used to determine the ungulate –primarily moose- winter-range potential for low-elevation areas in the Parsnip and Finlay River drainages (e.g., low snow-depth zone = high winter-range potential).

## RESULTS AND DISCUSSION

### 1994 Survey

During the March 1994 survey, snow depths were measured at 104 sites (Table 1). Measurements were made at 41 sites located adjacent to the Parsnip and Finlay Reaches of the Williston Reservoir, 49 sites along the major tributaries that flow into these reaches, and 14 sites in caribou-frequented areas (high and low elevation sites) (Appendix A). Sites were located primarily in small forest openings (28 sites, included unplowed secondary logging roads) and wetlands/meadows (33 sites). In some cases such sites were not available or accessible by helicopter, therefore, sampling was conducted in early-seral logged areas (16 sites), along lakes and rivers (11 sites), and adjacent to plowed primary logging roads (11 sites); 5 sites were not described.

Intra-site snow depth measurements generally had low variance, however, some site measurements were relatively disparate (i.e., 95% CI >20% of mean) (Table 1). These large measurement discrepancies were mainly attributable to the presence of heavy snow accumulations (>120 cm) and measurement error (e.g., measurement suspected to be made between a sub-surface ice layer and the snow surface).

Although most other sites had relatively low measurement variance, snow depths at a few of these sites were not thought to be indicative of the site's snow accumulation for 1994, relative to the other sites. The inclement weather that postponed the survey from early to mid-March also brought uncharacteristic above-freezing temperatures and rain to some localised areas. The degree of snow compaction and melt that resulted at individual sites appeared to vary depending on its location, exposure and elevation as ice crusts on the snow surface ranged from non-

Table 1. Mean snow depth measurements for sites sampled within the Parsnip and Finlay River drainages, Williston Reservoir watershed, March 1994.

| Site No. | Elev. (m) | Snow depth (cm) n | Mean | S.D. | Biogeo. subz. |
|---|---|---|---|---|---|
| 1 | 790 | 2 | 52.5[1] | 3.5 | SBSvk |
| 2 | 790 | 3 | 20.0[1] | 0.0 | SBSvk |
| 3 | 760 | 3 | 131.0 | 14.4 | SBSvk |
| 4 | 750 | 2 | 94.0[1] | 45.3 | SBSvk |
| 5 | 730 | 2 | 51.0[1] | 1.4 | SBSwk1 |
| 6 | 730 | 3 | 136.7 | 22.0 | SBSwk1 |
| 7 | 760 | 3 | 111.3 | 2.3 | SBSvk |
| 8 | 820 | 3 | 155.3 | 39.1 | SBSvk |
| 9 | 840 | 4 | 141.5 | 13.9 | SBSvk |
| 10 | 760 | 5 | 59.0[1] | 1.8 | SBSwk1 |
| 11 | 750 | 3 | 135.0 | 13.0 | SBSwk1 |
| 12 | 720 | 4 | 130.3 | 4.4 | SBSwk1 |
| 13 | 700 | 4 | 82.8 | 2.4 | SBSwk2 |
| 14 | 670 | 4 | 69.8 | 1.0 | SBSmk1 |
| 15 | 660 | 3 | 104.3 | 0.6 | SBSwk2 |
| 16 | 730 | 3 | 123.3 | 7.6 | SBSmk2 |
| 17 | 780 | 3 | 96.0 | 8.7 | SBSwk2 |
| 18 | 700 | 4 | 65.8 | 1.7 | SBSmk2 |
| 19 | 780 | 4 | 68.8 | 2.1 | SBSmk1 |
| 20 | 820 | 3 | 78.0 | 0.0 | SBSmk1 |
| 21 | 880 | 4 | 89.5 | 3.7 | SBSmk1 |
| 22 | 1,020 | 4 | 117.8 | 3.9 | ESSFmv3 |
| 23 | 1,010 | 4 | 100.8 | 2.6 | SBSmk1 |
| 24 | 1,220 | 4 | 55.8[1] | 4.1 | ESSFmv3 |
| 25 | 1,550 | 4 | 140.5 | 0.6 | ESSFmv3 |
| 26 | 900 | 3 | 91.0 | 1.0 | SBSmk1 |
| 27 | 1,340 | 4 | 133.5 | 1.0 | ESSFmv3 |
| 28 | 1,520 | 3 | 151.0 | 1.0 | ESSFmv3 |
| 29 | 1,070 | 4 | 86.5 | 4.4 | BWBSdk1 |
| 30 | 810 | 4 | 78.8 | 2.2 | BWBSdk1 |
| 31 | 790 | 4 | 68.5 | 1.3 | BWBSdk1 |
| 32 | 910 | 4 | 74.3 | 2.5 | BWBSdk1 |
| 33 | 780 | 4 | 74.3 | 4.9 | BWBSdk1 |
| 34 | 1,070 | 4 | 65.3 | 1.3 | BWBSdk1 |
| 35 | 910 | 4 | 82.5 | 1.3 | BWBSdk1 |
| 36 | 980 | 4 | 72.3 | 0.5 | BWBSdk1 |
| 37 | 820 | 4 | 93.0 | 5.8 | BWBSdk1 |
| 38 | 990 | 3 | 41.0[1] | 5.3 | BWBSdk1 |
| 39 | 850 | 4 | 91.3 | 2.2 | BWBSdk1 |
| 40 | 820 | 4 | 76.0 | 2.0 | BWBSdk1 |
| 41 | 880 | 4 | 77.0 | 0.0 | BWBSdk1 |
| 42 | 910 | 4 | 87.5 | 4.2 | BWBSdk1 |
| 43 | 1,100 | 4 | 87.8 | 0.5 | BWBSdk1 |
| 44 | 880 | 4 | 76.5 | 3.0 | BWBSdk1 |
| 45 | 910 | 4 | 85.3 | 1.7 | BWBSdk1 |
| 46 | 880 | 4 | 65.0 | 1.4 | BWBSdk1 |
| 47 | 1,680 | 4 | 89.5 | 2.1 | SWBmk |
| 48 | 1,550 | 4 | 88.0 | 1.4 | ESSFmv4 |
| 49 | 780 | 2 | 58.0 | 2.8 | BWBSdk1 |
| 50 | 720 | 3 | 52.0 | 1.7 | BWBSdk1 |
| 51 | 1,280 | 4 | 85.8 | 1.9 | ESSFmv4 |
| 52 | 1,010 | 4 | 83.8 | 1.5 | ESSFmv4 |
| 53 | 700 | 4 | 57.8 | 1.0 | BWBSdk1 |
| 54 | 730 | 4 | 77.8 | 1.0 | BWBSdk1 |
| 55 | 780 | 4 | 67.8 | 1.0 | BWBSdk1 |
| 56 | 940 | 4 | 68.3 | 3.0 | BWBSdk1 |
| 57 | 910 | 4 | 88.5 | 2.4 | BWBSdk1 |
| 58 | 780 | 4 | 71.5 | 3.5 | BWBSdk1 |
| 59 | 720 | 4 | 64.8 | 6.4 | BWBSdk1 |
| 60 | 690 | 4 | 54.3 | 1.0 | BWBSdk1 |
| 61 | 700 | 4 | 56.0 | 3.4 | BWBSdk1 |
| 62 | 1,050 | 4 | 83.0 | 5.3 | SBSmk2 |
| 63 | 690 | 4 | 65.5 | 1.9 | SBSmk2 |
| 64 | 690 | 3 | 85.0 | 2.6 | SBSmk2 |
| 65 | 720 | 4 | 73.3 | 3.1 | SBSmk2 |
| 66 | 790 | 4 | 71.3 | 1.0 | SBSmk2 |
| 67 | 760 | 4 | 85.8 | 2.8 | SBSmk2 |
| 68 | 760 | 4 | 92.5 | 6.2 | SBSmk2 |
| 69 | 790 | 4 | 87.5 | 3.0 | SBSmk2 |
| 70 | 690 | 4 | 61.0 | 4.8 | SBSmk2 |
| 71 | 690 | 4 | 75.5 | 4.0 | SBSmk2 |
| 72 | 760 | 4 | 74.3 | 3.0 | SBSmk2 |
| 73 | 750 | 4 | 61.0 | 3.4 | SBSmk2 |
| 74 | 720 | 4 | 24.5[1] | 0.6 | SBSmk2 |
| 75 | 700 | 3 | 80.3 | 2.1 | SBSmk2 |
| 76 | 730 | 4 | 77.3 | 1.7 | SBSmk2 |
| 77 | 910 | 3 | 103.0 | 2.0 | SBSmk2 |
| 78 | 750 | 4 | 59.0 | 3.6 | SBSmk2 |
| 79 | 750 | 4 | 44.3 | 2.5 | SBSmk2 |
| 80 | 690 | 4 | 79.8 | 5.2 | SBSmk2 |
| 81 | 720 | 4 | 68.0 | 3.3 | SBSmk2 |
| 82 | 700 | 3 | 41.3 | 1.2 | SBSmk2 |
| 83 | 700 | 4 | 26.8 | 1.7 | SBSmk2 |
| 84 | 790 | 4 | 69.5 | 1.3 | SBSmk2 |
| 85 | [illegible] | 4 | 79.5 | 4.4 | SBSmk2 |
| 86 | 790 | 4 | 74.5 | 2.4 | SBSwk2 |
| 87 | 720 | 4 | 65.5 | 1.9 | SBSmk2 |
| 88 | 730 | 3 | 55.0[1] | 4.4 | SBSmk2 |
| 89 | 700 | 1 | 101* | | SBSmk2 |
| 90 | 690 | 4 | 74.8 | 4.6 | SBSmk2 |
| 91 | 780 | 3 | 96.0 | 1.0 | SBSmk2 |
| 92 | 720 | 3 | 120.3 | 8.4 | SBSwk2 |
| 93 | 720 | 2 | 67.5[1] | 17.7 | SBSwk2 |
| 94 | 670 | 4 | 90.5 | 2.9 | SBSmk1 |
| 95 | 670 | 4 | 97.5 | 1.3 | SBSwk1 |
| 96 | 670 | 4 | 95.5 | 5.8 | SBSmk1 |
| 97 | 670 | 3 | 132.3 | 2.5 | SBSmk1 |
| 1a | 750 | 3 | 73.3 | 1.2 | SBSmk2 |
| 2a | 750 | 3 | 67.7 | 2.1 | SBSmk2 |
| 3a | 750 | 3 | 73.3 | 3.2 | SBSmk2 |
| 4a | 750 | 3 | 77.7 | 1.5 | SBSmk2 |
| 5a | 750 | 3 | 83.3 | 0.6 | SBSmk2 |
| 6a | 750 | 3 | 83.3 | 1.2 | SBSmk2 |
| 7a | 750 | 3 | 84.0 | 0.0 | SBSmk2 |

[1] Mean snow depth was not used to identify the site's zone designation in Table 2 due to snow melt bias, measurement error, or site influences; instead, the zone designation was based on snow depths from surrounding sites, the local provincial weather station and/or the authors' judgement.

existent to several centimetres. In one extreme localised case near Tutu Creek (#89), just north of Mackenzie, snow accumulations at the selected site (previously surveyed in 1990) had melted considerably, resulting in many patches being devoid of any snow. The 1994 survey was thus forced to select an alternate site nearby. Still, only an approximate measurement (>1 m) could be obtained as a significant ice crust, that could not be easily broken through, was present at the alternate site; the measurement was obtained by manoeuvring the metre-stick as far as possible down a hole adjacent to a willow stem. Data from the provincial weather stations supported this local disparity as April snow depths at the Mackenzie station (700 m) were reduced by 63 cm (62%) from early March levels whereas the more southern McLeod Lake (980 m) and Pacific Lake (770 m) stations only reported a 16-cm (8%) and 10-cm (10%) decrease, respectively (Figure 2, Appendix B; BC Environment 1997). Consequently, when determining the zone designation for a particular site, surface snow-melt was subjectively taken into consideration; for example, if an ice crust (e.g., >1 cm) was present at the surface and the mean snow depth for the site was at the upper end of a zone (e.g., top 10 cm), the zone identifier for the site was raised to the deeper snow zone. Where measurement error or site influences were thought to have occurred, snow depths at surrounding sites and/or the author's judgement were used to determine the site's snow-depth zone. Zone designations were adjusted for 10 sites: #1, 2, 4, 5, 10, 24, 38, 74, 88 and 93.

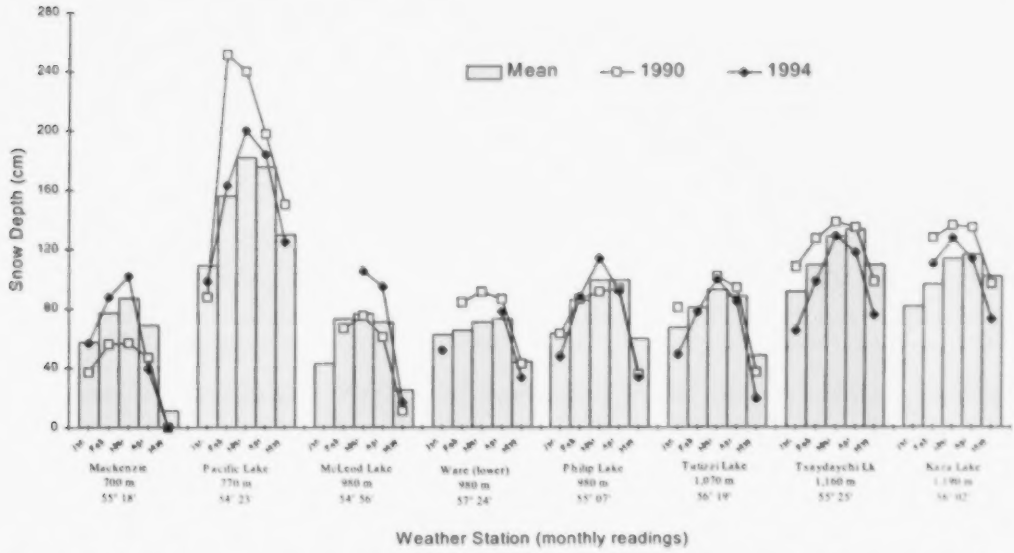


Figure 2. Monthly snow depths (mean, 1990 and 1994) from lower elevation provincial weather stations in the Parsnip and Finlay River drainages, Williston Reservoir watershed, January to May (BC Environment 1997).

Nine low-elevation sites had snow depths <60 cm in 1994, all were in close proximity to the reservoir: Weston Creek (#82), Strandberg Bay (#83), 2 sites on the south side of the Ospika Arm (#78 and 79), and 5 sites near the Ingenika Arm (#49, 50, 53, 60 and 61) (Figure 3, Table 2). The Strandberg Bay site was the only location that had a snow accumulation <40 cm. All caribou areas had snow depths greater than 60 cm (Figure 3); the 3 sites with moderate snow depths were situated at lower elevations and in areas typically used by caribou in late winter (Wood 1996).

Snow depths did not increase with increasing latitude. On the contrary, the most southern sites (Parsnip and Crooked River sites) generally had the greatest snow depths (Table 2, Figure 4). But, broad snow-depth patterns were generally consistent within biogeoclimatic subzones (Figure 5). Snow accumulations were less deep (<80 cm) in the SBSmk and BWBSdk subzones and deeper (>80 cm) in the SBSwk, SBSvk, ESSFmv and SWBmk subzones. This was expected as the biogeoclimatic-subzone designation for an area is largely dependent on the area's regional climate (e.g., moisture and temperature regimes), which is also influenced by elevation (Meidinger and Pojar 1991). Within the SBSmk and BWBSdk subzones, however, there were a wide range of snow depths between sites, snow accumulations ranged from very low to very deep. Localised climatic irregularities, likely due to surrounding topographic influences, are assumed to cause these intra-subzone differences (see following section).

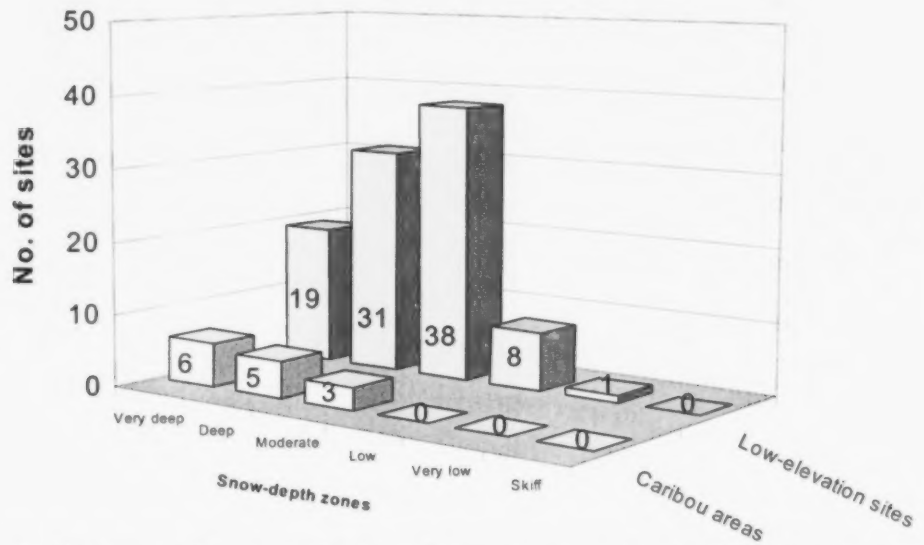


Figure 3. Frequency of snow-depth zones at low-elevation sites (<1,150 m) and caribou areas in the Parsnip and Finlay River drainages, Williston Reservoir watershed, March 1994. Low-elevation and caribou sites are not mutually exclusive.

Table 2. Snow-depth zone designations[1] for sites surveyed within the Parsnip and Finlay River drainages, Williston Reservoir watershed, March 1994.

| Geographic Area | Site No. | Elev. (m) | Biogeo. subzone | Snow-depth zone |
|---|---|---|---|---|
| *Crooked River* | | | | |
| Crooked R @ Caine | 97 | 670 | SBSmk1 | very deep |
| Redrocky Lk | 96 | 670 | SBSmk1 | deep |
| Crooked R @ Weedon | 95 | 670 | SBSwk1 | deep |
| McLeod Lk northwest | 94 | 670 | SBSmk1 | deep |
| *Parsnip River* | | | | |
| Arctic Lk | 1 | 790 | SBSvk | very deep[2] |
| Missinka R, upper | 2 | 790 | SBSvk | very deep[2] |
| Parsnip R @ Hominka | 5 | 730 | SBSwk1 | very deep[2] |
| Hominka R, lower | 4 | 750 | SBSvk | very deep[2] |
| Hominka R, middle | 3 | 760 | SBSvk | very deep |
| Parsnip R @ Table | 6 | 730 | SBSwk1 | very deep |
| Table R, middle | 7 | 760 | SBSvk | very deep |
| Table R, upper | 8 | 820 | SBSvk | very deep |
| Parsnip R @ Anzac | 11 | 750 | SBSwk1 | very deep |
| Anzac R, lower mid | 10 | 760 | SBSwk1 | very deep[2] |
| Anzac R, middle | 9 | 840 | SBSvk | very deep |
| Parsnip R @ Reynolds | 12 | 720 | SBSwk1 | very deep |
| Misinchinka R @ Kenned | 13 | 700 | SBSwk2 | deep |
| Misinchinka R @ Trapper | 93 | 720 | SBSwk2 | deep[2] |
| Misinchinka R @ Old Frie | 92 | 720 | SBSwk2 | very deep |
| *Parsnip Reach (east)* | | | | |
| Mischinsinlika Ck | 14 | 670 | SBSmk1 | moderate |
| Tutu Ck | 89 | 700 | SBSmk2 | very deep |
| Cut Thumb Ck | 90 | 690 | SBSmk2 | moderate |
| Weston Ck | 82 | 700 | SBSmk2 | low |
| Canty Ck | 81 | 720 | SBSmk2 | moderate |
| *Parsnip Reach (west)* | | | | |
| Scovil Ck | 15 | 660 | SBSwk2 | very deep |
| Tsedeitla Lk | 16 | 730 | SBSmk2 | very deep |
| Dastaiga Ck | 17 | 780 | SBSwk2 | deep |
| Nation Arm west | 18 | 700 | SBSmk2 | moderate |
| Nation Arm north | 91 | 780 | SBSmk2 | deep |
| 15 Mile Swamp | 88 | 730 | SBSmk2 | moderate[2] |
| Manson Arm @ Manson | 87 | 720 | SBSmk2 | moderate |
| Shoal Lk west | 85 | 880 | SBSmk2 | deep |
| Strandberg Bay | 83 | 700 | SBSmk2 | very low |
| Muscovite Lks | 84 | 790 | SBSmk2 | moderate |
| *Nation River* | | | | |
| Philip Ck | 19 | 780 | SBSmk1 | moderate |
| Rainbow Ck | 20 | 820 | SBSmk1 | moderate |
| Chuchi Lk | 21 | 880 | SBSmk1 | deep |
| *Manson River* | | | | |
| Manson R @ 6 km | 86 | 790 | SBSwk2 | moderate |
| Manson Lks | 26 | 900 | SBSmk1 | deep |
| *Gillis Creek area* | | | | |
| Klawli Lk (C) | 23 | 1,010 | SBSmk1 | very deep |
| Moosmoos Ck (C) | 22 | 1,020 | ESSFmv3 | very deep |
| Squawfish Lk (C) | 24 | 1,220 | ESSFmv3 | very deep[2] |
| Mt Gillis (C) | 25 | 1,550 | ESSFmv3 | very deep |
| Gillis Ck (C) | 27 | 1,340 | ESSFmv3 | very deep |
| Baldy Mtn (C) | 28 | 1,520 | ESSFmv3 | very deep |
| *Omineca River* | | | | |
| Omineca R @ Osilinka | 39 | 850 | BWBSdk1 | deep |
| 8 km N of Blue Lk | 38 | 990 | BWBSdk1 | deep[2] |
| Omineca R @ Blue | 37 | 820 | BWBSdk1 | deep |
| Blue Lk (C) | 36 | 980 | BWBSdk1 | moderate |
| Jackfish Ck (C) | 34 | 1,070 | BWBSdk1 | moderate |
| Germansen Ldg east (C) | 35 | 910 | BWBSdk1 | deep |
| Omineca R @ Nina | 33 | 780 | BWBSdk1 | moderate |
| *Omineca River (cont'd)* | | | | |
| Nina Ck | 32 | 910 | BWBSdk1 | moderate |
| Omineca R @ Discovery | 31 | 790 | BWBSdk1 | moderate |
| Omineca R @ Silver | 30 | 810 | BWBSdk1 | moderate |
| Germansen Lk (C) | 29 | 1,070 | BWBSdk1 | deep |
| *Osilinka River* | | | | |
| Osilinka R @ Hidden | 40 | 820 | BWBSdk1 | moderate |
| Osilinka R @ camp | 41 | 880 | BWBSdk1 | moderate |
| Osilinka R @ Tenakihi | 42 | 910 | BWBSdk1 | deep |
| *Mesilinka River* | | | | |
| N of 184 km lake | 67 | 760 | SBSmk2 | deep |
| Mesilinka R @ Prospecto | 66 | 790 | SBSmk2 | moderate |
| Mesilinka R bend | 44 | 880 | BWBSdk1 | moderate |
| Tutizika R east | 43 | 1,100 | BWBSdk1 | deep |
| *Carina-Tomias / Chase Mtn* | | | | |
| Carina Lk (C) | 45 | 910 | BWBSdk1 | deep |
| Tomias Lk (C) | 46 | 880 | BWBSdk1 | moderate |
| Mt Ferguson west (C) | 47 | 1,680 | SWBmk | deep |
| Chase Mtn west (C) | 48 | 1,550 | ESSFmv4 | deep |
| Swannell R, middle | 52 | 1,010 | ESSFmv4 | deep |
| *Ingenika River* | | | | |
| Ingenika R @ Swannell | 49 | 780 | BWBSdk1 | low |
| Ingenika R @ crag | 50 | 720 | BWBSdk1 | low |
| Isola Lk | 51 | 1,280 | ESSFmv4 | deep |
| Ingenika R @ Pelly | 53 | 700 | BWBSdk1 | low |
| Ingenika R @ Wrede | 54 | 730 | BWBSdk1 | moderate |
| Pelly Ck @ Zigadene | 55 | 780 | BWBSdk1 | moderate |
| Pelly Lk | 56 | 940 | BWBSdk1 | moderate |
| *Finlay Reach (west)* | | | | |
| Omineca Arm @ Mesilink | 68 | 760 | SBSmk2 | deep |
| Omineca Arm north | 69 | 790 | SBSmk2 | deep |
| Bob Fry Ck | 70 | 690 | SBSmk2 | moderate |
| Chunamon Ck | 71 | 690 | SBSmk2 | moderate |
| Tears Ck | 65 | 720 | SBSmk2 | moderate |
| Ole Ck | 64 | 690 | SBSmk2 | deep |
| Factor Ross Ck | 63 | 690 | SBSmk2 | moderate |
| Factor Ross Ck north | 62 | 1,050 | SBSmk2 | deep |
| Frank Ck north | 61 | 700 | BWBSdk1 | low |
| Ingenika Arm | 60 | 690 | BWBSdk1 | low |
| Bluff Hill north | 58 | 780 | BWBSdk1 | moderate |
| Bluff Hill northeast | 59 | 720 | BWBSdk1 | moderate |
| Bluff Hill northwest | 57 | 910 | BWBSdk1 | deep |
| *Finlay Reach (east)* | | | | |
| Bevel Ck | 80 | 690 | SBSmk2 | deep |
| Ospika Arm southwest | 79 | 750 | SBSmk2 | low |
| Ospika Arm southeast | 78 | 750 | SBSmk2 | low |
| Ospika Arm northeast | 74 | 720 | SBSmk2 | moderate[2] |
| Ospika Arm northeast | 1a | 750 | SBSmk2 | moderate |
| Ospika Camp | 2a | 750 | SBSmk2 | moderate |
| Ospika Camp west | 72 | 760 | SBSmk2 | moderate |
| Tobin Lk south | 73 | 750 | SBSmk2 | moderate |
| Tobin Lk north | 3a | 750 | SBSmk2 | moderate |
| Lafferty Ck | 4a | 750 | SBSmk2 | moderate |
| Collins Ck | 5a | 750 | SBSmk2 | deep |
| Bruin Ck | 6a | 750 | SBSmk2 | deep |
| Davis R | 7a | 750 | SBSmk2 | deep |
| *Ospika River* | | | | |
| Ospika R @ Stevenson | 75 | 700 | SBSmk2 | deep |
| Ospika R @ Aley | 76 | 730 | SBSmk2 | moderate |
| Ospika R @ Balden | 77 | 910 | SBSmk2 | very deep |

[1] Snow depth zones: *skiff* (0-19.9 cm), *very low* (20.0-39.9 cm), *low* (40.0-59.9 cm), *moderate* (60.0-79.9 cm), *deep* (80.0-99.9 cm) and *very deep* (≥100 cm).

[2] Snow-depth zone designation was increased from its mean snow depth due to snow melt bias, measurement error, and/or site influences.

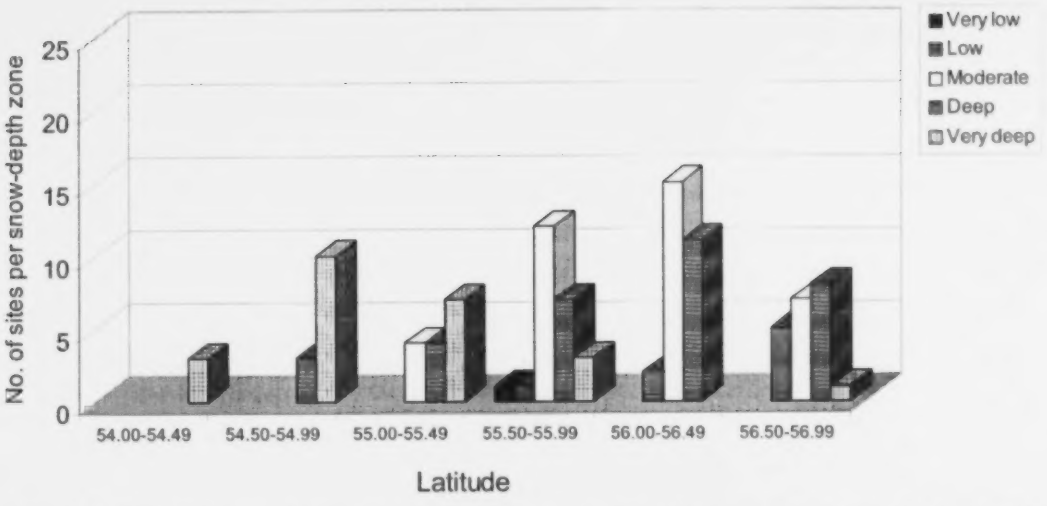


Figure 4. Site frequency, based on snow-depth zones, at different latitudes within the surveyed area, Williston Reservoir watershed, March 1994. Snow-depth zones: very low (20.0-39.9 cm), low (40.0-59.9 cm), moderate (60.0-79.9 cm), deep (80.0-99.9 cm) and very deep (≥100 cm).

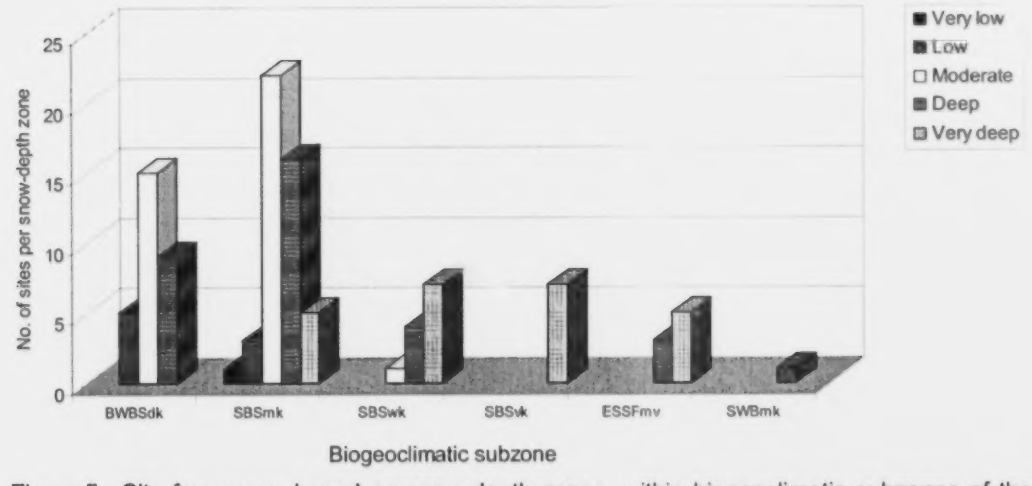


Figure 5. Site frequency, based on snow-depth zones, within biogeoclimatic subzones of the surveyed area, Williston Reservoir watershed, March 1994. Snow-depth zones: very low (20.0-39.9 cm), low (40.0-59.9 cm), moderate (60.0-79.9 cm), deep (80.0-99.9 cm) and very deep (≥100 cm).

**Between-year Snow Depth Comparison (1990 and 1994)**

Although there was a difference in the timing of the 1990 and 1994 surveys (late Jan/early Feb 1990 versus mid-Mar 1994), we felt that the 1990 survey adequately depicted the March snow levels (i.e., the deepest snow depths for the year) as all provincial weather stations recorded February 1990 snow depths that were within 10% of their March readings, and both February and March 1990 readings were within the same snow-depth zone (Figure 2, Appendix B).

For 30 areas that were surveyed in 1990 and 1994, between-year comparisons indicated a relatively low variability in their inter-year snow-depth zone (Table 3). Twenty-four areas (80%) maintained the same snow-depth zone in both years, this included areas that had only 1 zone that was similar when composite zones were compared; 9 of the 10 areas, that did not have the exact same composite zones, had a deeper zone in 1994. Five areas had greater snow accumulations in 1994 than in 1990, and only 1 site had less snow in 1994. All but 4 areas had moderate or better snow depths (<80 cm) in at least one of the survey years.

Snow depths at weather stations in March 1990 were quite variable (±35% of their mean snow depth), however, only 3 stations had snow accumulations that were ±1 snow-depth zone compared to its mean snow-depth zone (Appendix B). In March 1994, weather stations had snow accumulations that were 0 to 37% higher than their mean snow depth, 4 stations had snow accumulations that were in a higher snow-depth zone than its mean zone. As a result, if there was a discrepancy between snow-depth zones for the two survey years (e.g., 1990 – moderate, 1994 – deep), year-specific deviations from the proximal weather station's mean snow-depth zone were taken into consideration when the winter-range potential ranking was determined for an area. Due to the juxtaposition of weather stations, only areas in the southern Parsnip Reach (Mackenzie station) and upper Osilinka and Mesilinka (Tutizzi station) areas were potentially adjusted.

Within the SBS and BWBS zones of the Parsnip and Finlay River drainages, low-elevation areas had a diversity of winter-range potentials, from nil to high (Table 3, Figure 6 and 7). Six areas had high winter-range potential: 3 areas each in the BWBSdk (Ingenika-Finlay area) and SBSmk (Strandberg Bay-Finlay Forks and Ospika Arm south areas). Areas with moderate winter-range potential were mainly adjacent to the high winter-range areas, but were also along the mid-Omineca River (west of Germansen Landing), lower Osilinka River and mid-Mesilinka

Table 3. Snow-depth zones[1] (1990 and 1994) and ungulate winter range potential[2] for low-elevation areas within the Parsnip and Finlay River drainages, Williston Reservoir watershed. Upper elevation boundaries were assumed to be 850 m for SBSmk and 1,100 m for SBSwk and BWBSdk areas, unless otherwise noted.

| Geographic area | Biogeoclimatic subzone[3] | Snow-depth zone | | Range potential |
|---|---|---|---|---|
| | | 1990 | 1994 | |
| *Parsnip Reach (east)* | | | | |
| Pack R to Mugaha Ck (<1,100) | SBSmk / SBSwk | very deep | very deep[4] | N |
| Mugaha Ck to Lamonti Ck | SBSmk | moderate | very deep-moderate | L |
| Lamonti Ck to Weston Arm (<800 m) | SBSmk | moderate-low | n/a | M |
| Weston Arm to Finlay Forks | SBSmk | low-very low | low-moderate | H-M |
| *Parsnip Reach (west)* | | | | |
| Pack R to Nation Arm south (<1,100 m) | SBSmk / SBSwk | deep-moderate | very deep-deep | L |
| Nation Bay south to Maybeline Lk | SBSmk | low-moderate | moderate-deep | M |
| Maybeline Lk to Manson R north | SBSmk | moderate-low | moderate | M |
| Manson R north to Omineca Arm | SBSmk | low-moderate | very low-moderate | H-M |
| Manson R north to Omineca Arm (850-1,100 m) | SBSwk | low-deep | moderate[5] | M-L |
| *Manson River* | | | | |
| Carmella Ck to Granite Ck | SBSmk | moderate | deep | L-M |
| *Omineca River* | | | | |
| Omineca Arm to Germansen Ldg | BWBSdk | moderate-deep | moderate-deep | M-L |
| Germansen Ldg to Old Hogem | BWBSdk | moderate-deep | moderate | M |
| Germansen Lk west (850-1,100 m) | BWBSdk | moderate | deep | L-M |
| *Osilinka River* | | | | |
| Hidden Valley to End Lk | BWBSdk | moderate | moderate | M |
| End Lk to Tenakihi Ck | BWBSdk | moderate | deep | M |
| *Mesilinka River* | | | | |
| Dog Canyon to Prospector Ck south | SBSmk | deep | deep | L |
| Prospector Ck south – Mesilinka R bend | BWBSdk (SBSmk) | n/a | moderate | M |
| Mesilinka R bend to Blackpine Lk | BWBSdk | deep | deep | L |
| Carina Lk to Tomias Lk (850-1,100 m) | BWBSdk | moderate | deep-moderate | M-L |
| *Finlay Reach (west)* | | | | |
| Omineca Arm to Corless Bay (<1,000 m) | SBSmk | moderate-deep | moderate-deep | M-L |
| Corless Bay to Mica Pk east (<1,000 m) | SBSmk | deep | moderate | L-M |
| Mica Pk east to Mt Ross east (<1,000 m) | SBSmk | moderate | moderate | M |
| Mica Pk east to Mt Ross east (1,000-1,100 m) | SBSwk | n/a | deep | L |
| Mt Ross east to Estella Lks | BWBSdk | low | low-moderate | H |
| *Ingenika River* | | | | |
| Ingenika Arm to Pelly Ck | BWBSdk | low | low | H |
| Swannell R (900-1,100 m) | BWBSdk | moderate | deep | M-L |
| Pelly Lk area | BWBSdk | n/a | moderate | M |
| *Ospika River* | | | | |
| Gauvreau Ck to Aley Ck north | SBSmk | moderate | moderate-deep | M-L |
| Aley Ck north to Balden Ck | SBSmk | very deep | very deep | N |
| *Finlay Reach (east)* | | | | |
| Finlay Forks to Bevel Ck north | SBSmk | moderate | deep | M-L |
| Bevel Ck north to Ospika Arm south | SBSmk | low | low | H |
| Ospika Arm north to Tobin Lk | SBSmk | low-moderate | low-moderate | M-H |
| Tobin Lk to Lafferty Ck north | SBSmk | moderate-low | moderate | M |
| Lafferty Ck north to Shovel Ck | SBSmk | deep | deep | L |
| Shovel Ck to Rubyred Ck | BWBSdk (SBSmk) | low-moderate | n/a | H-M |

[1] Snow depth zones: *skiff* (0-19.9 cm), *very low* (20.0-39.9 cm), *low* (40.0-59.9 cm), *moderate* (60.0-79.9 cm), *deep* (80.0-99.9 cm) and *very deep* (≥100 cm). Based on Table 1 for 1994 and Martin (1994) for 1990.

[2] An area's potential to provide winter range habitat based solely on snow depth: H (high potential), M (moderate potential), L (low potential), N (very low or no potential).

[3] Biogeoclimatic subzones: dry-cool Boreal White and Black Spruce (BWBSdk); moist-cool (SBSmk), wet-cool (SBSwk) and very wet-cool (SBSvk) Sub-boreal Spruce; moist-very cold Engelmann Spruce – Subalpine Fir (ESSFmv); and moist-cool Spruce-Willow-Birch (SWBmk). A slash indicates that the area covers the stated subzones approximately equally; subzones in parentheses are less prominent.

[4] Snow-depth zone is based on datum from the Mackenzie weather station.

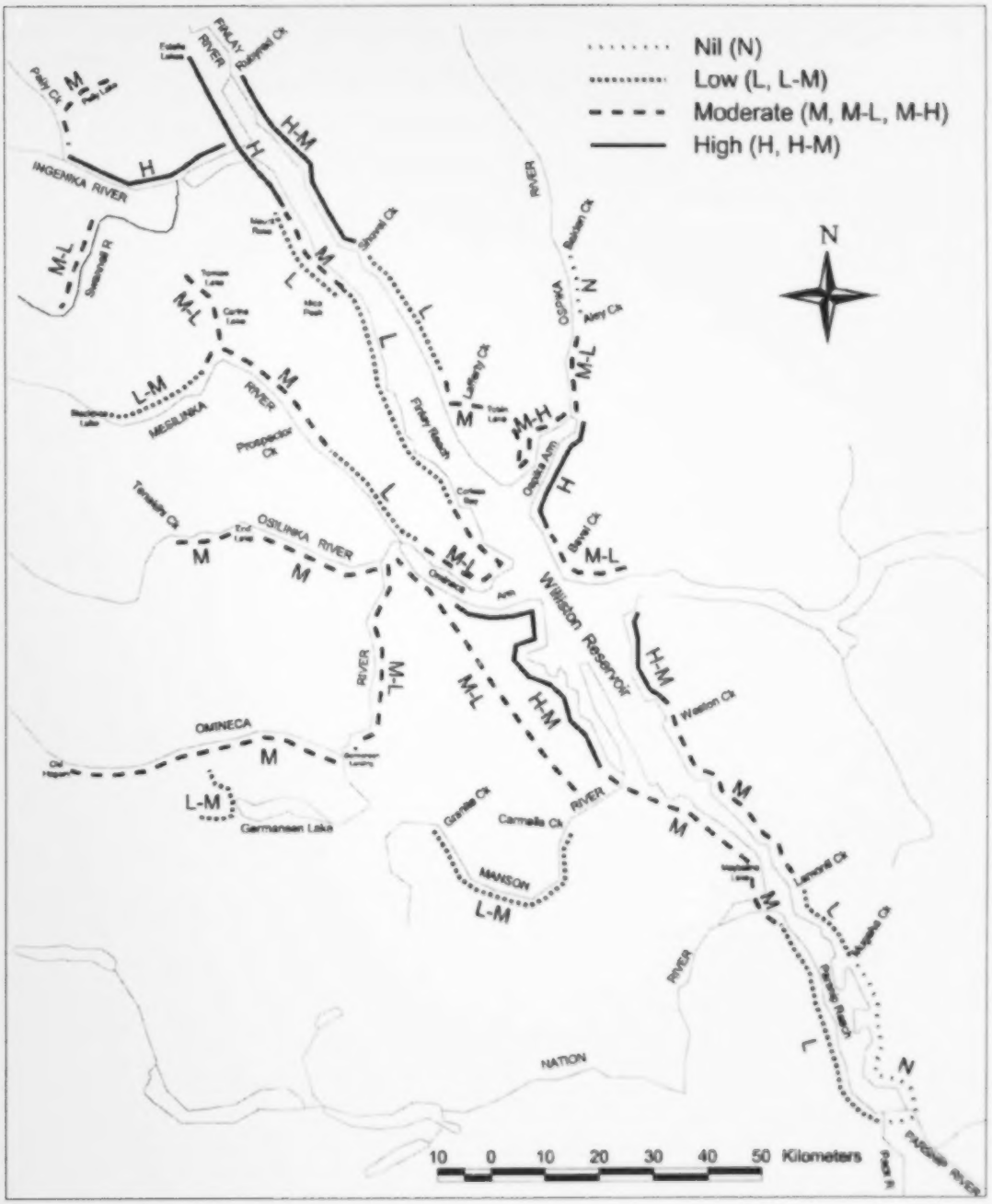


Figure 6. Diagrammatic map depicting the ungulate winter-range potential, based solely on snow depths, within low-elevation areas of the Parsnip and Finlay River drainages, Williston Reservoir watershed.

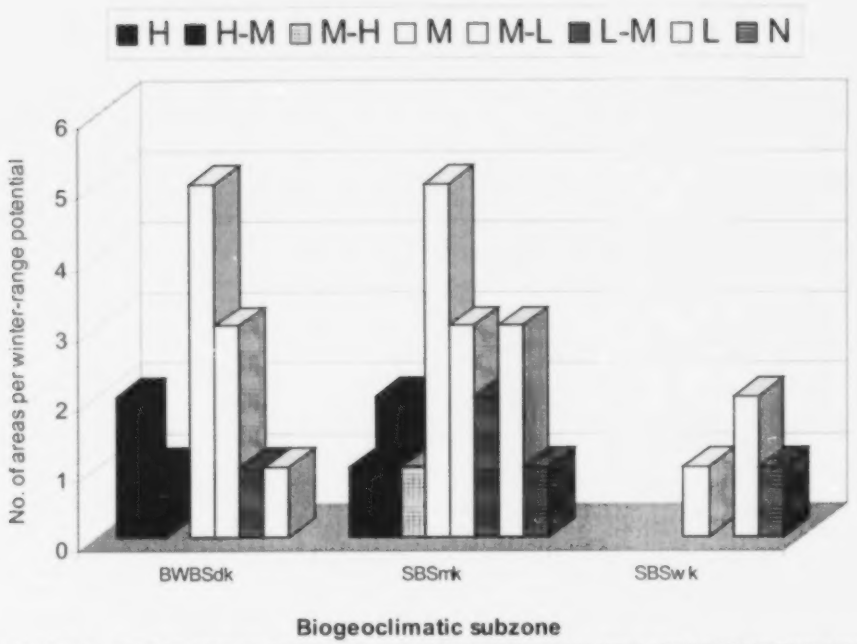


Figure 7. Frequency of low-elevation areas, based on their ungulate winter-range potential (nil, low, moderate and high), within the biogeoclimatic subzones of the Parsnip and Finlay River drainages, Williston Reservoir watershed.

River (east of river bend). The southern Parsnip Reach and mid-Finlay Reach areas were ranked as having the lowest winter-range potential.

Localised climatic irregularities, likely due to surrounding topographic influences, are assumed to cause these intra-subzone differences. The lower snow accumulations in and around the Ingenika Arm area are thought to be a consequence of the area being situated on the east side of the Omineca Mountains and at the northern end of the reservoir. During the winter, the prevailing weather patterns come from the northwest, therefore the area is on the lee-side of the Omineca Mountains that likely results in a rain-shadow effect. Also, this area is probably influenced by moisture, created by the reservoir, to a lesser extent than more southern areas, as the moisture likely precipitates out further south down the Rocky Mountain Trench. Similarly, the climate around the Strandberg Bay-Finlay Forks area, at the mid-point of the reservoir, is thought to be influenced by local climatic differences due to weather systems that bisect the Rocky Mountains via the Peace canyon. The cause of the apparent lower snow depths on the south side of the Ospika Arm (northerly aspect), compared to the snow accumulations on the north shore (southerly aspect), is unknown.

In general, areas identified with a moderate to high winter-range potential were consistent with known ungulate winter ranges in the surveyed area. It is relevant to note that surveyed snow depths were largely measured in small openings on relatively level ground. Therefore, these measured sites likely have (slightly) greater snow accumulations than sites located within the forest where snow interception can occur, and on more exposed southerly-facing slopes where the sun and wind can have a greater affect. Both conditions can greatly influence the use of an area by ungulates. Other factors to consider when assessing the full winter-range potential of an area include the specific ungulate species being considered, possible predation risks, and the type, amount and distribution of forage.

During winter, concentrations of moose have been observed in the lower Ingenika-Finlay and mid-Omineca River areas (Demarchi 2000, Hengeveld and Corbould 2000, Hatler 1990). A winter moose survey of areas adjacent to the Parsnip Reach found that moose were most numerous between the Nation River and the Omineca Arm (i.e., areas identified with moderate to high winter-range potential) (Hatler 1989). Hatler (1990) also found a concentration of moose in the Ospika Arm area. The relatively few moose observed on the east side of the Finlay Reach between Lafferty Creek and the Ingenika area (Hatler 1990), and adjacent to the southern portion of the Parsnip Reach (Hatler 1989) also coincided with the lower winter-range potential ratings for these areas. Hatler (1989) did find that a small concentration of moose was present adjacent to the southeastern corner of the Parsnip Reach, Gagnon Creek to Mischinsinlika Creek, but it is suspected that the relatively low snow depths present at the time (<60 cm) and/or the higher forage availability (e.g., cutblocks) may have had an influence.

Elk can be found sporadically throughout the surveyed area but, during winter, groups of animals have only been observed in the Ingenika-Finlay and lower Ospika River areas (Hatler 1990, Hengeveld and Wood 2000, F. Corbould personal observation).

Deer, both mule (Odocoileus hemionus hemionus) and white-tailed (O. virginianus), are uncommon in the Parsnip and Finlay River drainages. Nevertheless, during winter, individuals and small groups (usually <6 animals) have been infrequently observed along the foreshores of the northern Parsnip Reach and in the lower Ospika River drainage (Hatler 1989 and 1990, F. Corbould personal observation). A small number of mule deer have also been reported to periodically overwinter in conifer stands near the Mackenzie townsite.

Within the Williston Reservoir watershed, extensive areas with lower snow accumulations (<60 cm; Martin 1990) and sizeable ungulate populations (Hengeveld and Wood 2001, Hirst 1990) are also known to exist along the north shore of the Peace Reach, from Schooler Creek eastward to Bullhead Mountain. Elk, mule and white-tailed deer, moose, and Stone's sheep all use the north shore of the Peace Reach as winter range (Backmeyer 2000a and b, Hengeveld and Wood 2001, F. Corbould personal observation). These areas are situated primarily within the moist-warm BWBS (BWBSmw) subzone that has annual snowfalls similar to the BWBSdk (DeLong 1990, MacKinnon et al 1990), however, they are situated on slopes with a southern aspect, that also receive warm chinook winds, that help to reduce the snowpack. Areas north of Estella Lakes, adjacent to the Finlay River, are also thought to have relatively low snow depths (<60 cm; Martin 1994). Consequently, in addition to the areas rated with high and moderate winter-range potential in the Parsnip and Finlay River drainages, areas along the north Peace Reach and lower Finlay River should be considered when identifying sites to be further assessed for potential enhancement activities.

**Cost Summary - 1994 Survey**

The cost of conducting the 1994 survey in the Parsnip and Finlay River drainages was $10,980; this does not include staff time required to plan, co-ordinate and conduct the survey, or enter the survey data. A total of 16.5 hours ($10,700) of helicopter time over a 2-day period was needed to survey the 97 sites. Food and accommodation at Munro Camp for the 3 people (pilot, 2 surveyors) and miscellaneous supplies accounted for the remaining $280.

Although surveys -such as those conducted in 1990 and 1994- only provide snow-depth levels for a snap-shot in time at each site, if they are conducted when snow depths are at their deepest level, they do provide useful information over a large area that can be used to help identify potential core winter ranges at a relatively low cost, compared to remote snow stations that cost over $4,000 per station (excluding set-up and data retrieval costs).

**ACKNOWLEDGEMENTS**

We would like to thank Kelly Fleut (FCCL) for collecting snow depth data from areas along the east side of the Finlay Reach, and the Wildlife Technical Committee for providing comments on earlier drafts.

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escriptions and snow depth measurements for sites sampled within the Parsnip and Finlay River drainages of the Williston Reservoir watershed,
t.

| Site Description | | | Site Location Information | | | | | | | | | | Snow Measurement Information | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Latitude | | Longitude | | UTM | | | Elevation | | Map | Msmt. | 1994 snow measurements (cm) | | | | | | | | |
| | General | Type | Deg | Min | Deg | Min | Zone | E | N | ft | m | Sheet | Date | #1 | #2 | #3 | #4 | #5 | n | Mean | S D | Zone | Comments |
| | forest opening | FO | trib | 54 | 26 14 | 121 | 41 86 | 10 | 584474 | 6032561 | 2600 | 790 | 93I/ 5 | 15-Mar-94 | 55 | 50 | | | | 2 | 53 | 3 5 | very deep | |
| | wetland in forest | W | trib | 54 | 36 06 | 121 | 44 72 | 10 | 581054 | 6050900 | 2600 | 790 | 93I/12 | 15-Mar-94 | 20 | 20 | 20 | | | 3 | 20 | 0 0 | very deep | moose on river |
| | wetland off of river | W | trib | 54 | 41 29 | 121 | 53 38 | 10 | 571580 | 6060650 | 2500 | 760 | 93I/ 5 | 15-Mar-94 | 147 | 127 | 119 | | | 3 | 131 | 14 4 | very deep | old moose tracks |
| | wetland off of river | W | trib | 54 | 40 95 | 121 | 58 54 | 10 | 566043 | 6059727 | 2450 | 750 | 93I/12 | 15-Mar-94 | 62 | 126 | | | | 2 | 94 | 45 3 | very deep | 200m d/s of bridge |
| | wetland off of river | W | trib | 54 | 37 63 | 122 | 5 45 | 10 | 558697 | 6053468 | 2400 | 730 | 93J/ 9 | 15-Mar-94 | 50 | 52 | | | | 2 | 51 | 1 4 | very deep | |
| | forest opening | FO | trib | 54 | 42 22 | 122 | 15 84 | 10 | 547428 | 6061849 | 2400 | 730 | 93J/ 9 | 15-Mar-94 | 125 | 123 | 162 | | | 3 | 137 | 22 0 | very deep | |
| | wetland (small meadow) | W | trib | 54 | 45 24 | 122 | 7 63 | 10 | 556176 | 6067551 | 2500 | 760 | 93J/16 | 15-Mar-94 | 110 | 114 | 110 | | | 3 | 111 | 2 3 | very deep | 100m from railway tracks |
| | meadow | M | trib | 54 | 48 63 | 122 | 0 08 | 10 | 564185 | 6073946 | 2700 | 820 | 93J/16 | 15-Mar-94 | 200 | 139 | 127 | | | 3 | 155 | 39 1 | very deep | |
| | forest opening | FO | trib | 54 | 53 84 | 122 | 20 06 | 10 | 542692 | 6083354 | 2750 | 840 | 93J/16 | 15-Mar-94 | 134 | 150 | 156 | 126 | | 4 | 142 | 13 9 | very deep | lots of tracks (35-45cm moose sinking depth) |
| | bank of river side channel | R/L | trib | 54 | 51 56 | 122 | 25 53 | 10 | 536879 | 6079074 | 2500 | 760 | 93J/16 | 15-Mar-94 | 60 | 60 | 60 | 56 | 58 | 5 | 59 | 1 8 | very deep | 0 5 km d/s of bridge crossing |
| | meadow in forest | M | trib | 54 | 49 01 | 122 | 30 47 | 10 | 531627 | 6074304 | 2450 | 750 | 93J/15 | 15-Mar-94 | 150 | 128 | 127 | | | 3 | 135 | 13 0 | very deep | |
| | small opening | FO | trib | 54 | 54 98 | 122 | 40 40 | 10 | 520941 | 6085314 | 2350 | 720 | 93J/15 | 15-Mar-94 | 133 | 126 | 135 | 127 | | 4 | 130 | 4 4 | very deep | at end of more open forest (Sb) |
| ady | opening in Pl flat | FO | trib | 55 | 6 37 | 122 | 48 39 | 10 | 512346 | 6106407 | 2300 | 700 | 93O/ 2 | 15-Mar-94 | 86 | 81 | 81 | 83 | | 4 | 83 | 2 4 | deep | S end of runway at Kennedy siding |
| | wetland (foreshore?) bum? | W | reach | 55 | 11 43 | 123 | 2 79 | 10 | 497039 | 6115776 | 2200 | 670 | 93O/ 3 | 15-Mar-94 | 69 | 71 | 69 | 70 | | 4 | 70 | 1 0 | moderate | |
| | bank of side channel | R/L | reach | 55 | 13 87 | 123 | 11 69 | 10 | 487608 | 6120318 | 2150 | 660 | 93O/ 3 | 15-Mar-94 | 104 | 105 | 104 | | | 3 | 104 | 0 6 | very deep | |
| | forest opening | FO | reach | 55 | 20 44 | 123 | 15 38 | 10 | 483741 | 6132516 | 2400 | 730 | 93O/ 6 | 15-Mar-94 | 125 | 115 | 130 | | | 3 | 123 | 7 6 | very deep | near spur road |
| | wetland area | W | reach | 55 | 26 29 | 123 | 24 41 | 10 | 474259 | 6143412 | 2550 | 780 | 93O/ 6 | 15-Mar-94 | 102 | 100 | 86 | | | 3 | 96 | 8 7 | deep | |
| | small lake | R/L | reach | 55 | 28 42 | 123 | 35 34 | 10 | 462767 | 6147445 | 2300 | 700 | 93O/ 5 | 15-Mar-94 | 66 | 68 | 64 | 65 | | 4 | 66 | 1 7 | moderate | betw. Nation R. and Blackwater L |
| | cutblock | CC | trib | 55 | 18 71 | 123 | 39 22 | 10 | 458510 | 6129472 | 2550 | 780 | 93O/ 5 | 15-Mar-94 | 67 | 67 | 70 | 71 | | 4 | 69 | 2 1 | moderate | |
| | meadow in SBS | M | trib | 55 | 14 30 | 123 | 52 78 | 10 | 444062 | 6121451 | 2700 | 820 | 93O/ 4 | 15-Mar-94 | 78 | 78 | 78 | | | 3 | 78 | 0 0 | moderate | tracks on river nearby |
| | wetland area | W | trib | 55 | 12 84 | 124 | 13 74 | 10 | 421801 | 6119079 | 2900 | 880 | 93N/ 1 | 15-Mar-94 | 93 | 85 | 88 | 92 | | 4 | 90 | 3 7 | deep | 0 75km NE of road |
| | meadow | M | caribou | 55 | 21 78 | 124 | 28 95 | 10 | 406025 | 6135972 | 3360 | 1020 | 93N/ 8 | 15-Mar-94 | 120 | 122 | 114 | 115 | | 4 | 118 | 3 9 | very deep | along Moosemoose Ck |
| | wetland/meadow | W | caribou | 55 | 22 06 | 124 | 41 19 | 10 | 393107 | 6136786 | 3300 | 1010 | 93N/ 7 | 15-Mar-94 | 102 | 103 | 97 | 101 | | 4 | 101 | 2 6 | very deep | |
| | meadow | M | caribou | 55 | 27 16 | 124 | 31 38 | 10 | 403676 | 6146005 | 4000 | 1220 | 93N/ 7 | 15-Mar-94 | 57 | 61 | 52 | 53 | | 4 | 56 | 4 1 | very deep | 400 m E side of Squawfish Lake |
| | meadow | M | caribou | 55 | 30 02 | 124 | 28 46 | 10 | 406867 | 6151243 | 5100 | 1550 | 93N/ 9 | 15-Mar-94 | 140 | 141 | 140 | 141 | | 4 | 141 | 0 6 | very deep | in saddle |
| | bank of river | R/L | trib | 55 | 34 55 | 124 | 18 83 | 10 | 417164 | 6159441 | 2950 | 900 | 93N/ 9 | 15-Mar-94 | 90 | 91 | 92 | | | 3 | 91 | 1 0 | deep | |
| | opening in forest | FO | caribou | 55 | 32 19 | 124 | 33 79 | 10 | 401346 | 6155390 | 4400 | 1340 | 93N/10 | 15-Mar-94 | 133 | 135 | 133 | 133 | | 4 | 134 | 1 0 | very deep | N of Gillis Ck |
| | opening in forest | FO | caribou | 55 | 33 51 | 124 | 37 24 | 10 | 397775 | 6157921 | 5000 | 1520 | 93N/10 | 15-Mar-94 | 151 | 152 | 150 | | | 3 | 151 | 1 0 | very deep | Mt. Baldy |
| | wet meadow | M | caribou | 55 | 40 71 | 124 | 57 93 | 10 | 376405 | 6171835 | 3500 | 1070 | 93N/10 | 15-Mar-94 | 85 | 93 | 83 | 85 | | 4 | 87 | 4 4 | deep | 200m off W end of airstrip |
| | wet meadow | M | trib | 55 | 45 69 | 125 | 24 69 | 10 | 348686 | 6181954 | 2650 | 810 | 93N/14 | 15-Mar-94 | 76 | 78 | 80 | 81 | | 4 | 79 | 2 2 | moderate | numerous tx, moose sinking depth 35cm |
| y | wet meadow | M | trib | 55 | 47 96 | 125 | 6 41 | 10 | 367928 | 6185541 | 2600 | 790 | 93N/14 | 15-Mar-94 | 68 | 69 | 70 | 67 | | 4 | 69 | 1 3 | moderate | |
| | river bank nearby | R/L | trib | 55 | 52 49 | 124 | 50 41 | 10 | 384865 | 6193465 | 3000 | 910 | 93N/15 | 15-Mar-94 | 75 | 77 | 71 | 74 | | 4 | 74 | 2 5 | moderate | W side of Nina Ck, moose tx down river |
| | | ? | trib | 55 | 48 83 | 124 | 47 99 | 10 | 387212 | 6180611 | 2550 | 780 | 93N/15 | 15-Mar-94 | 68 | 73 | 77 | 79 | | 4 | 74 | 4 9 | moderate | lots of tx in vicinity |
| | Pl forest opening | FO | caribou | 55 | 46 92 | 124 | 33 39 | 10 | 402380 | 6182699 | 3500 | 1070 | 93N/15 | 15-Mar-94 | 65 | 67 | 64 | 65 | | 4 | 65 | 1 3 | moderate | |
| :) | | ? | caribou | 55 | 46 70 | 124 | 37 63 | 10 | 397938 | 6182393 | 3000 | 910 | 93N/15 | 15-Mar-94 | 83 | 81 | 84 | 82 | | 4 | 83 | 1 3 | deep | moose tx |
| | opening in forest | FO | caribou | 55 | 53 43 | 124 | 29 19 | 10 | 407029 | 6194677 | 3200 | 980 | 93N/16 | 15-Mar-94 | 72 | 72 | 73 | 72 | | 4 | 72 | 0 5 | moderate | |
| | forest opening | FO | trib | 55 | 53 51 | 124 | 35 01 | 10 | 400966 | 6194960 | 2700 | 820 | 93N/15 | 15-Mar-94 | 87 | 89 | 98 | 98 | | 4 | 93 | 5 8 | deep | |
| | meadow | M | trib | 55 | 57 54 | 124 | 30 31 | 10 | 406027 | 6202325 | 3250 | 990 | 93N/15 | 15-Mar-94 | 43 | 45 | 35 | | | 3 | 41 | 5 3 | deep | |
| | opening in forest | FO | trib | 56 | 4 69 | 124 | 33 68 | 10 | 402821 | 6215664 | 2800 | 850 | 94C/ 2 | 15-Mar-94 | 92 | 93 | 88 | 92 | | 4 | 91 | 2 2 | deep | |
| | on spur road | URD | trib | 56 | 4 23 | 124 | 37 52 | 10 | 398818 | 6214903 | 2700 | 820 | 94C/ 2 | 15-Mar-94 | 77 | 73 | 77 | 77 | | 4 | 76 | 2 0 | moderate | |
| | lake shore | R/L | trib | 56 | 6 74 | 124 | 46 65 | 10 | 389466 | 6219792 | 2900 | 880 | 94C/ 2 | 15-Mar-94 | 77 | 77 | 77 | 77 | | 4 | 77 | 0 0 | moderate | |
| | opening off road | RD | trib | 56 | 8 66 | 125 | 8 16 | 10 | 367286 | 6223084 | 3000 | 910 | 94C/ 3 | 15-Mar-94 | 83 | 85 | 90 | 92 | | 4 | 88 | 4 2 | deep | |
| | meadow, opening off rd | M | trib | 56 | 17 78 | 125 | 17 32 | 10 | 358364 | 6241202 | 3600 | 1100 | 94C/ 6 | 15-Mar-94 | 88 | 88 | 88 | 87 | | 4 | 88 | 0 5 | deep | opening off road |
| | opening in forest | FO | trib | 56 | 26 20 | 124 | 59 08 | 10 | 377625 | 6256234 | 2900 | 880 | 94C/ 7 | 15-Mar-94 | 78 | 72 | 78 | 78 | | 4 | 77 | 3 0 | moderate | cleared for log dump |
| | wetland area | W | caribou | 56 | 31 80 | 124 | 59 29 | 10 | 377710 | 6266626 | 3000 | 910 | 94C/10 | 15-Mar-94 | 85 | 83 | 86 | 87 | | 4 | 85 | 1 7 | deep | |
| | shore of Tomas Ck | R/L | caribou | 56 | 36 04 | 125 | 5 64 | 10 | 371441 | 6274684 | 2900 | 880 | 94C/11 | 15-Mar-94 | 64 | 67 | 64 | 65 | | 4 | 65 | 1 4 | moderate | |
| | opening in forest | FO | caribou | 56 | 37 78 | 125 | 3 93 | 10 | 373258 | 6277858 | 5500 | 1680 | 94C/11 | 15-Mar-94 | 87 | 89 | 90 | 92 | | 4 | 90 | 2 1 | deep | |
| | opening in forest | FO | caribou | 56 | 33 78 | 125 | 21 22 | 10 | 355359 | 6279009 | 5100 | 1550 | 94C/11 | 15-Mar-94 | 88 | 87 | 87 | 90 | | 4 | 88 | 1 4 | deep | caribou tx in vicinity |
| | edge of Pl flat | FO | trib | 56 | 43 45 | 125 | 6 93 | 10 | 370545 | 6285455 | 2550 | 780 | 94C/11 | 15-Mar-94 | 56 | 60 | | | | 2 | 58 | 2 8 | low | adjacent to N. Mtn helipad fuel stop |
| | forest opening | FO | trib | 56 | 42 53 | 125 | 15 65 | 10 | 361598 | 6287045 | 2350 | 720 | 94C/11 | 16-Mar-94 | 51 | 51 | 54 | | | 3 | 52 | 1 7 | low | top of slope along river |
| | | ? | trib | 56 | 44 53 | 125 | 16 44 | 10 | 360915 | 6290781 | 4200 | 1280 | 94C/11 | 16-Mar-94 | 86 | 83 | 87 | 87 | | 4 | 86 | 1 9 | deep | 100m E of lake, moose sinking depth 35-45cm |
| | edge of a cutblock | CC | trib | 56 | 35 01 | 125 | 24 50 | 10 | 352080 | 6273407 | 3300 | 1010 | 94C/11 | 16-Mar-94 | 85 | 85 | 83 | 82 | | 4 | 84 | 1 5 | deep | a few tx in cutblock |
| | forest opening | FO | trib | 56 | 46 10 | 125 | 27 36 | 10 | 349890 | 6294077 | 2300 | 700 | 94C/14 | 16-Mar-94 | 57 | 58 | 59 | 57 | | 4 | 58 | 1 0 | low | |
| | side channel bank | R/L | trib | 56 | 46 80 | 125 | 42 53 | 10 | 334493 | 6295958 | 2400 | 730 | 94C/13 | 16-Mar-94 | 78 | 77 | 77 | 79 | | 4 | 78 | 1 0 | moderate | bank of Wrede Ck |
| | bank | R/L | trib | 56 | 49 67 | 125 | 28 18 | 10 | 349294 | 6300728 | 2550 | 780 | 94C/14 | 16-Mar-94 | 67 | 67 | 68 | 69 | | 4 | 68 | 1 0 | moderate | banks of Pelly Ck. just up from Zyg |
| | | ? | trib | 56 | 52 64 | 125 | 23 50 | 10 | 354245 | 6306087 | 3100 | 940 | 94C/14 | 16-Mar-94 | 69 | 72 | 67 | 65 | | 4 | 68 | 3 0 | moderate | |
| | | ? | reach | 56 | 51 33 | 125 | 6 33 | 10 | 371607 | 6303064 | 3000 | 910 | 94C/14 | 16-Mar-94 | 85 | 89 | 90 | 90 | | 4 | 89 | 2 4 | deep | |

| Site Description | | | | Site Location Information | | | | | | | | | | Snow Measurement Information | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Latitude | | Longitude | | UTM | | | Elevation | | Map | Msmt. | 1994 snow measurements (cm) | | | | | | | | | |
| ) | General | Type | Area | Deg | Min | Deg | Min | Zone | E | N | ft | m. | Sheet | Date | #1 | #2 | #3 | #4 | #5 | n | Mean | S.D. | Zone | Comments |
| | opening in forest/meadow | FO | reach | 56 | 52.20 | 125 | 3.10 | 10 | 374937 | 6304578 | 2550 | 780 | 94C/14 | 16-Mar-94 | 74 | 75 | 68 | 69 | | 4 | 72 | 3.5 | moderate | 2 caribou on lake nearby |
| | on secondary road | URD | reach | 56 | 51.74 | 124 | 59.02 | 10 | 379057 | 6303802 | 2350 | 720 | 94C/15 | 16-Mar-94 | 60 | 61 | 64 | 74 | | 4 | 65 | 6.4 | moderate | |
| | on secondary road | URD | reach | 56 | 46.83 | 124 | 56.58 | 10 | 381278 | 6294424 | 2250 | 690 | 94C/15 | 16-Mar-94 | 53 | 55 | 55 | 54 | | 4 | 54 | 1.0 | low | |
| | end of landing on spur rd | CC | reach | 56 | 42.69 | 124 | 48.50 | 10 | 389302 | 6286520 | 2300 | 700 | 94C/10 | 16-Mar-94 | 60 | 52 | 57 | 55 | | 4 | 56 | 3.4 | low | |
| | wetland area | W | reach | 56 | 37.00 | 124 | 45.23 | 10 | 392368 | 6275879 | 3450 | 1050 | 94C/10 | 16-Mar-94 | 78 | 80 | 84 | 90 | | 4 | 83 | 5.3 | deep | mineral lick? tx at site & leading down ck draw |
| | on spur road | URD | reach | 56 | 37.03 | 124 | 41.91 | 10 | 395764 | 6275849 | 2275 | 690 | 94C/10 | 16-Mar-94 | 65 | 67 | 63 | 67 | | 4 | 66 | 1.9 | moderate | |
| | wetland | W | reach | 56 | 28.82 | 124 | 31.90 | 10 | 405516 | 6256671 | 2250 | 690 | 94C/ 7 | 16-Mar-94 | 84 | 83 | 88 | | | 3 | 85 | 2.6 | deep | |
| | cutblock | CC | reach | 56 | 18.56 | 124 | 28.68 | 10 | 408559 | 6241276 | 2350 | 720 | 94C/ 8 | 16-Mar-94 | 75 | 69 | 73 | 76 | | 4 | 73 | 3.1 | moderate | edge of spur road |
| for | spur road | URD | trib | 56 | 18.35 | 124 | 47.27 | 10 | 389382 | 6241341 | 2600 | 790 | 94C/ 7 | 16-Mar-94 | 72 | 71 | 70 | 72 | | 4 | 71 | 1.0 | moderate | beside Prospector Ck bridge - gravel pit |
| | cutblock | CC | trib | 56 | 10.89 | 124 | 33.00 | 10 | 403784 | 6227148 | 2500 | 760 | 94C/ 2 | 16-Mar-94 | 84 | 83 | 87 | 89 | | 4 | 86 | 2.8 | deep | on road |
| rke | forest opening | FO | reach | 56 | 7.98 | 124 | 27.26 | 10 | 409608 | 6221584 | 2500 | 760 | 94C/ 1 | 16-Mar-94 | 99 | 96 | 85 | 90 | | 4 | 93 | 6.2 | deep | |
| | cutblocks | CC | reach | 56 | 2.86 | 124 | 16.90 | 10 | 420163 | 6211911 | 2600 | 790 | 94C/ 1 | 16-Mar-94 | 84 | 90 | 86 | 90 | | 4 | 88 | 3.0 | deep | |
| | cutblock landing | CC | reach | 56 | 8.57 | 124 | 15.07 | 10 | 422256 | 6222468 | 2250 | 690 | 94C/ 1 | 16-Mar-94 | 64 | 64 | 54 | 62 | | 4 | 61 | 4.8 | moderate | on landing |
| | cutblock | CC | reach | 56 | 13.36 | 124 | 21.52 | 10 | 415751 | 6231479 | 2275 | 690 | 94C/ 1 | 16-Mar-94 | 81 | 72 | 73 | 76 | | 4 | 76 | 4.0 | moderate | off old spur road in cutblock |
| | clearing beside road | RD | reach | 56 | 16.66 | 124 | 7.47 | 10 | 430370 | 6237336 | 2500 | 760 | 94C/ 8 | 16-Mar-94 | 71 | 73 | 75 | 78 | | 4 | 74 | 3.0 | moderate | at 4 Km sign |
| | willow complex | W | reach | 56 | 19.50 | 124 | 8.76 | 10 | 429127 | 6242628 | 2450 | 750 | 94C/ 8 | 16-Mar-94 | 57 | 60 | 62 | 65 | | 4 | 61 | 3.4 | moderate | at S end of Tobin Lk, moose in vicinity |
| | clearing beside road | RD | reach | 56 | 18.57 | 123 | 59.77 | 10 | 438368 | 6240759 | 2350 | 720 | 94B/ 5 | 16-Mar-94 | 24 | 24 | 25 | 25 | | 4 | 25 | 0.6 | moderate | 2nd pullout along straight stretch, near 2.5 km mark |
| | old side channel | R/L | trib | 56 | 22.90 | 123 | 58.31 | 10 | 439986 | 6248770 | 2300 | 700 | 94B/ 5 | 16-Mar-94 | 78 | 82 | 81 | | | 3 | 80 | 2.1 | deep | 100m off road at 18.25 km |
| | opening along side channel | R/L | trib | 56 | 27.98 | 123 | 55.33 | 10 | 443180 | 6258151 | 2400 | 730 | 94B/ 5 | 16-Mar-94 | 78 | 75 | 77 | 79 | | 4 | 77 | 1.7 | moderate | side channel of Alley Ck |
| | opening in forest, near river | FO | trib | 56 | 35.04 | 123 | 56.14 | 10 | 442526 | 6271259 | 3000 | 910 | 94B/12 | 16-Mar-94 | 101 | 105 | 103 | | | 3 | 103 | 2.0 | very deep | fresh moose tx |
| | willow thicket - open area | W | reach | 56 | 18.30 | 123 | 57.20 | 10 | 441011 | 6240221 | 2450 | 750 | 94B/ 5 | 16-Mar-94 | 54 | 62 | 59 | 61 | | 4 | 59 | 3.6 | low | area well browsed & lots of tx |
| | wetland | W | reach | 56 | 11.26 | 124 | 4.39 | 10 | 433395 | 6227485 | 2450 | 750 | 93N/ 1 | 16-Mar-94 | 41 | 44 | 47 | 45 | | 4 | 44 | 2.5 | low | moose tx in area, moose kill site |
| | opening in forest | FO | reach | 56 | 5.82 | 124 | 2.01 | 10 | 435705 | 6217357 | 2275 | 690 | 93N/ 1 | 16-Mar-94 | 76 | 75 | 82 | 86 | | 4 | 80 | 5.2 | deep | 7.5m off shoreline |
| | cutblock | CC | reach | 55 | 57.34 | 123 | 46.58 | 10 | 451525 | 6201203 | 2350 | 720 | 93O/13 | 16-Mar-94 | 64 | 68 | 68 | 72 | | 4 | 68 | 3.3 | moderate | |
| | cutblock | CC | reach | 55 | 53.32 | 123 | 44.45 | 10 | 453662 | 6193722 | 2300 | 700 | 93O/13 | 16-Mar-94 | 42 | 40 | 42 | | | 3 | 41 | 1.2 | low | wolf tx |
| | cutblock | CC | reach | 55 | 56.58 | 124 | 3.47 | 10 | 433927 | 6200027 | 2300 | 700 | 93N/16 | 16-Mar-94 | 25 | 27 | 26 | 29 | | 4 | 27 | 1.7 | very low | |
| | cutblock | CC | reach | 55 | 57.78 | 124 | 13.93 | 10 | 423078 | 6202433 | 2600 | 790 | 93N/16 | 16-Mar-94 | 68 | 70 | 69 | 71 | | 4 | 70 | 1.3 | moderate | |
| | cutblock | CC | reach | 55 | 49.12 | 124 | 8.38 | 10 | 428588 | 6186271 | 2900 | 880 | 93N/16 | 16-Mar-94 | 75 | 77 | 85 | 81 | | 4 | 80 | 4.4 | deep | |
| | clearing beside road | RD | trib | 55 | 39.72 | 123 | 50.96 | 10 | 446566 | 6168574 | 2600 | 790 | 93O/12 | 16-Mar-94 | 78 | 73 | 73 | 74 | | 4 | 75 | 2.4 | moderate | pullout on mainline |
| n | cutblock | CC | reach | 55 | 44.66 | 123 | 49.03 | 10 | 448698 | 6177713 | 2350 | 720 | 93O/12 | 16-Mar-94 | 65 | 67 | 63 | 67 | | 4 | 66 | 1.9 | moderate | |
| | wetland | W | reach | 55 | 37.11 | 123 | 41.47 | 10 | 456469 | 6163623 | 2400 | 730 | 93O/12 | 16-Mar-94 | 60 | 53 | 52 | | | 3 | 55 | 4.4 | moderate | |
| | cutblock | CC | reach | 55 | 28.13 | 123 | 13.29 | 10 | 485996 | 6146772 | 2300 | 700 | 93O/ 6 | 16-Mar-94 | 101 | | | | | 1 | 101 | | very deep | |
| | nr sm pond on W side of rd | FO | reach | 55 | 32.29 | 123 | 18.52 | 10 | 480520 | 6154509 | 2250 | 690 | 93O/11 | 16-Mar-94 | 72 | 70 | 77 | 80 | | 4 | 75 | 4.6 | moderate | |
| | wetland area | W | reach | 55 | 31.52 | 123 | 27.61 | 10 | 470949 | 6153134 | 2550 | 780 | 93O/11 | 16-Mar-94 | 96 | 97 | 95 | | | 3 | 96 | 1.0 | deep | |
| rend | cutblock | CC | trib | 55 | 12.99 | 122 | 42.19 | 10 | 518886 | 6118709 | 2350 | 720 | 93O/ 2 | 16-Mar-94 | 116 | 130 | 115 | | | 3 | 120 | 8.4 | very deep | 12 moose in vicinity |
| ers | wetland | W | trib | 55 | 9.06 | 122 | 46.98 | 10 | 513829 | 6111401 | 2350 | 720 | 93O/ 2 | 16-Mar-94 | 80 | 55 | | | | 2 | 68 | 17.7 | deep | |
| | wetland/meadow? | W | trib | 54 | 57.52 | 123 | 1.67 | 10 | 498004 | 6089977 | 2200 | 670 | 93J/14 | 16-Mar-94 | 94 | 90 | 87 | 91 | | 4 | 91 | 2.9 | deep | |
| | wetland | W | trib | 54 | 46.70 | 122 | 50.14 | 10 | 510570 | 6069922 | 2200 | 670 | 93J/15 | 16-Mar-94 | 96 | 97 | 98 | 99 | | 4 | 98 | 1.3 | deep | |
| | wetland by lake | W | trib | 54 | 37.56 | 122 | 42.79 | 10 | 518519 | 6052998 | 2200 | 670 | 93J/10 | 16-Mar-94 | 90 | 91 | 101 | 100 | | 4 | 96 | 5.8 | deep | moose tx in area |
| | wetland area near river | W | trib | 54 | 29.34 | 122 | 43.13 | 10 | 518214 | 6037751 | 2200 | 670 | 93J/ 7 | 16-Mar-94 | 132 | 135 | 130 | | | 3 | 132 | 2.5 | very deep | 200m N of small powerline & road |
| | along mainline | RD | reach | 56 | 18.37 | 124 | 0.85 | 10 | 437250 | 6240400 | | 750 | | 28-Mar-94 | 72 | 74 | 74 | | | 3 | 73 | 1.2 | moderate | 7 Km on Ospika mainline (approx. lat/long brgs) |
| | along mainline | RD | reach | 56 | 18.22 | 124 | 5.93 | 10 | 431950 | 6236500 | | 750 | | 28-Mar-94 | 66 | 67 | 70 | | | 3 | 68 | 2.1 | moderate | junction of Davis/Ospika (approx. lat/long brgs) |
| | along mainline | RD | reach | 56 | 20.45 | 124 | 12.45 | 10 | 425350 | 6244450 | | 750 | | 28-Mar-94 | 72 | 71 | 77 | | | 3 | 73 | 3.2 | moderate | near Tobin Lake (approx. lat/long brgs) |
| | along mainline | RD | reach | 56 | 22.01 | 124 | 15.47 | 10 | 422300 | 6247400 | | 750 | | 28-Mar-94 | 76 | 78 | 79 | | | 3 | 78 | 1.5 | moderate | near Lafferty Ck (approx. lat/long brgs) |
| | along secondary road | RD | reach | 56 | 27.64 | 124 | 22.71 | 10 | 415050 | 6258000 | | 750 | | 28-Mar-94 | 84 | 83 | 83 | | | 3 | 83 | 0.6 | deep | near Collins Ck (approx. lat/long brgs) |
| | along secondary road | RD | reach | 56 | 29.23 | 124 | 23.55 | 10 | 414250 | 6260950 | | 750 | | 28-Mar-94 | 84 | 84 | 82 | | | 3 | 83 | 1.2 | deep | near Bruin Ck (approx. lat/long brgs) |
| | along secondary road | RD | reach | 56 | 33.07 | 124 | 28.81 | 10 | 409000 | 6268200 | | 750 | | 28-Mar-94 | 84 | 84 | 84 | | | 3 | 84 | 0.0 | deep | near Davis Bay (approx. lat/long brgs) |
| | near General Store | | | | | | | | | | 2700 | | | 15-Mar-94 | 66 | | | | | | | | | |

| | | | |
|---|---|---|---|
| | FO = forest opening | 23 | |
| ) rees | URD = on unplowed road | 5 | |
| | W = wetland | 22 | 41 reach |
| | M = meadow | 11 | 48 trib/ary |
| | CC = clearcut | 16 | 14 caribou |
| | R/L = alongside river or lake | 11 | 104 TOTAL |
| | RD = beside plowed road | 11 | |
| | ? = unknown | 5 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 104 | n | 105 | 103 | 98 | 69 | 1 | 104 | 104 | 103 | 105 | |
| 834.3 | mean | | | | | | 3.6 | 82 | | | |
| 197.9 | s.d. | | | | | | 0.6 | 26 | | | |
| 1680 | max | 200 | | | | | | | | | |
| 660 | min | 20 | | | | | | | | | |
| | max (mean) | | | | | | | 155.3 | | | |
| | min (mean) | | | | | | | 20.0 | | | |
| 760 | median | | | | | | | 77.9 | | | |

**APPENDIX B:** Monthly snow depths (mean, 1990, and 1994) at provincial weather stations located at lower elevation sites within the Parsnip and Finlay River drainages, Williston Reservoir watershed (BC Environment 1997).

| Weather Station | Month | Snow depth (cm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1994 | Mean | S.D. | n | Max | Min | Normal[1] |
| MACKENZIE A (700m) | 01-Jan | 37 | 57 | 57.6 | 19.1 | 22 | 109 | 27 | 54 |
| | 01-Feb | 56 | 88 | 76.9 | 24.1 | 22 | 122 | 36 | 77 |
| | 01-Mar | 57 | 102 | 87.0 | 27.7 | 22 | 143 | 51 | 85 |
| | 01-Apr | 47 | 39 | 68.4 | 25.8 | 23 | 119 | 0 | 72 |
| | 01-May | 0 | 0 | 11.3 | 19.7 | 23 | 70 | 0 | |
| PACIFIC LAKE (770m) | 01-Jan | 88 | 98 | 108.5 | 27.7 | 11 | 161 | 79 | |
| | 01-Feb | 251 | 163 | 156.0 | 39.2 | 27 | 251 | 104 | 160 |
| | 01-Mar | 240 | 200 | 181.5 | 41.1 | 32 | 240 | 99 | 183 |
| | 01-Apr | 198 | 184 | 175.6 | 39.2 | 32 | 262 | 97 | 179 |
| | 01-May | 150 | 125 | 129.9 | 46.8 | 30 | 224 | 22 | 136 |
| MC LEOD LAKE (980m) | 01-Jan | | | 42.5 | 11.2 | 11 | 59 | 24 | |
| | 01-Feb | 67 | | 73.0 | 22.0 | 31 | 114 | 29 | 74 |
| | 01-Mar | 75 | 105 | 76.6 | 24.3 | 35 | 130 | 32 | 77 |
| | 01-Apr | 61 | 95 | 70.9 | 23.8 | 35 | 127 | 20 | 73 |
| | 01-May | 11 | 17 | 25.5 | 23.7 | 35 | 75 | 0 | 28 |
| WARE (LOWER) (980m) | 01-Jan | | 52 | 62.5 | 14.7 | 4 | 84 | 52 | |
| | 01-Feb | 84 | | 65.4 | 15.4 | 26 | 100 | 45 | 61 |
| | 01-Mar | 91 | | 71.0 | 12.2 | 31 | 91 | 53 | 71 |
| | 01-Apr | 86 | 78 | 72.9 | 13.4 | 32 | 102 | 45 | 72 |
| | 01-May | 43 | 34 | 44.4 | 18.7 | 29 | 91 | 0 | 46 |
| PHILIP LAKE (980m) | 01-Jan | 63 | 48 | 62.8 | 16.2 | 12 | 100 | 48 | 65 |
| | 01-Feb | 86 | 88 | 85.6 | 20.7 | 28 | 127 | 56 | 86 |
| | 01-Mar | 91 | 114 | 98.9 | 21.1 | 31 | 135 | 63 | 98 |
| | 01-Apr | 93 | 92 | 98.8 | 19.1 | 32 | 137 | 66 | 101 |
| | 01-May | 36 | 34 | 60.0 | 26.5 | 31 | 107 | 0 | 64 |
| TUTIZZI LAKE (1,070m) | 01-Jan | 81 | 49 | 67.3 | 13.4 | 4 | 81 | 49 | |
| | 01-Feb | | 78 | 81.0 | 17.6 | 26 | 121 | 56 | 81 |
| | 01-Mar | 102 | 100 | 92.6 | 16.6 | 31 | 129 | 61 | 91 |
| | 01-Apr | 94 | 85 | 88.3 | 15.3 | 32 | 127 | 65 | 88 |
| | 01-May | 37 | 20 | 48.2 | 24.1 | 31 | 102 | 0 | 51 |
| TSAYDAYCHI LAKE (1,160m) | 01-Jan | 108 | 65 | 91.5 | 24.0 | 11 | 146 | 65 | 89 |
| | 01-Feb | 127 | 98 | 109.8 | 23.8 | 27 | 163 | 71 | 109 |
| | 01-Mar | 138 | 129 | 128.3 | 23.9 | 31 | 170 | 80 | 127 |
| | 01-Apr | 135 | 118 | 133.4 | 19.6 | 32 | 185 | 96 | 134 |
| | 01-May | 98 | 76 | 109.6 | 26.5 | 32 | 165 | 52 | 112 |
| KAZA LAKE (1190m) | 01-Jan | | | 81.4 | 22.2 | 9 | 134 | 55 | |
| | 01-Feb | 128 | 110 | 96.3 | 19.2 | 25 | 139 | 66 | 96 |
| | 01-Mar | 136 | 128 | 113.6 | 19.6 | 29 | 149 | 71 | 111 |
| | 01-Apr | 135 | 114 | 116.8 | 15.0 | 30 | 147 | 89 | 116 |
| | 01-May | 97 | 73 | 101.8 | 23.3 | 29 | 160 | 65 | 101 |

1 Normal snow depth is the average snow depth over a 30-year period (1960-1990).

**APPENDIX C:** Annual snowfall for biogeoclimatic subzones in the surveyed area of the Parsnip and Finlay River drainages, Williston Reservoir watershed.

| Biogeoclimatic Unit | | | Annual snowfall (cm) | | |
|---|---|---|---|---|---|
| Zone | Subzone | Elevation (m) | Mean | Range | Source |
| BWBS | dk1 | <1,100 | 180 | 135 - 279 | MacKinnon et al. 1990 |
| SBS | mk1 | <1,070 | 306 | 242 - 356 | DeLong et al. 1993 |
| | mk2 | <1,100 | 335 | n/a | MacKinnon et al. 1990 |
| | wk1 | 660-1,140 | 334 | 328 - 339 | DeLong 1996 |
| | wk2 | <1,100 | 1,075 | n/a | MacKinnon et al. 1990 |
| | vk | 615-1,320 | n/a | n/a | DeLong 1996 |
| ESSF | mv3 | 1,100-1,500 | n/a | n/a | MacKinnon et al. 1990 |
| | mv4 | 950-1,550 | n/a | n/a | DeLong et al. 1994 |
| SWB | mk | 1,050-1,500 | 270 | 145 - 395 | MacKinnon et al. 1990 |
| AT | n | >1,500 | 1,265 | 550 - 1,975 | MacKinnon et al. 1990 |